The listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (currently amended) A method of monitoring a sample containing a neutron source in which:

i) signals from a plurality of neutron detectors are analysed and the count rates for single, double and triple incidence of neutrons on the detectors are determined;

ii) the single, double and triple count rates are equated to a mathematical function related to the spontaneous fission rate, self-induced fission rate, detection efficiency and α,n reaction rate;

iii) a probability distribution is assigned to each of <u>the spontaneous fission rate,</u> the self-induced fission rate, detection efficiency and α,n reaction rate and each of the counting rates to provide a probability distribution factor for any given value, wherein the probability distribution assigned to,

the single, double, and triple count rates is a normal distribution,

<u>the spontaneous fission rate is a flat distribution,</u>

the self-induced fission rate is a ~~flat~~ <u>triangular</u> distribution,

the detector efficiency is a triangular distribution, and

the α,n reaction rate is a triangular distribution;

iv) and the value of the product of all the probability distribution factors is increased to give an optimized solution and so provide a value for the spontaneous fission rate which is linked to the mass of the neutron source.

2. (original) A method according to claim 1 in which the signals comprise a series of pulses, each pulse causing a time period to be considered, with other pulses being received in that period

being associated with the initial pulse, the number of pulses in the sequence giving the single, double, triple and greater numbers of neutron counts.

3. (previously presented) A method according to claim 1, wherein the single neutron count rate (R_1) is related to the spontaneous fission rate (F_s), the self induced fission rate (M), the detection efficiency (ε) and the α,n reaction rate (α) by the function:

$$R_1 = (\varepsilon)(F_s)(M)(\nu_{S1})(1+\alpha),$$

wherein ν_{S1} is a first spontaneous fission factorial moment for plutonium.

4. (currently amended) A method according to claim 1 in which the doublet counting rate $\underline{R_2}$ is related to the spontaneous fission rate, the self-multiplication factor, ~~where~~

$$[m = \frac{1-p}{(1-p)\nu_I}]$$

~~and p = probability first neutron causes induced fission;~~ the detection efficiency and the α,n reaction rate by the function

$$R_2 = \varepsilon^2 \cdot F_s \cdot M^2 \cdot \nu_{S2}\left(1+(M-1)(1+\alpha)\frac{\nu_{S1}\nu_{S2}}{\nu_{S2}(\nu_{S2}-1)}\right)$$

<u>where ν_{Sn} is the *n*th spontaneous fission factorial moment.</u>

5. (currently amended) A method according to claim 1 wherein the triplet counting rate $\underline{R_3}$ is related to the spontaneous fission rate, the self-multiplication factor, ~~where~~

$$[m = \frac{1-p}{(1-p)\nu_I}]$$

~~and p = probability first neutron causes induced fission;~~ the detection efficiency and the α,n reaction rate by the function

$$R_3 = \varepsilon^3 \cdot F_S \cdot M^3 \cdot \nu_{S3} \cdot \left(1 = 2(M-1)\frac{\nu_{S2}\nu_{S1}}{\nu_{S2}(\nu_{S1}-1)} = (M-1)(1+\alpha)\frac{\nu_{S2}\nu_{S3}}{\nu_{S3}(\nu_{S2}-1)}\left(1+2(M-1)\frac{\nu^2{}_{S1}}{\nu_{S3}(\nu_{S1}-1)}\right)\right)$$

<u>where ν_{Sn} is the *n*th spontaneous fission factorial moment.</u>

6. - 9. (cancelled)

10. (currently amended) A method according to claim 1 in which the distribution(s) are constrained within certain applied constraints/boundaries, such that the probability distribution factor is zero beyond the constraints or such that the probability distribution factor ~~rapidly~~ tends to zero beyond certain values.

11. (previously presented) A method according to claim 1 in which one or more of the constraints are set according to information gathered from a preceding isotopic consideration or analysis of the sample.

12. (currently amended) A method according to claim 1 in which the increasing, and ~~preferably maximisation~~, of the product of the probability distribution factors (pdf's) is ~~preferably~~ performed as an iterative process.

13. (currently amended) A method of monitoring a sample containing a neutron source having a neutron source mass, comprising:

analyzing signals from a plurality of neutron detectors;

determining a single incidence neutron count rate (R_1), a double incidence neutron count rate (R_2), and a triple incidence neutron count rate (R_3) associated with the neutron source based upon the analyzing;

equating the single, double and triple incidence neutron count rates to a mathematical function related to a spontaneous fission rate(F_s), a self-induced fission rate (M), a (α,n) reaction rate (α) and a detection efficiency (ε);

assigning a probability distribution to each of the spontaneous vision rate, self induced fission rate, the detection efficiency, the α,n reaction rate and each of the counting rates;

obtaining ~~providing~~ probability distribution factors ~~functions~~ for a set of trial values ~~value~~;

calculating an overall value of a product of all the probability distribution factors ~~functions~~; and

varying one or more of the trial values so as generate ~~generating~~ a maximal overall value for the product of all probability distribution factors, the value of ~~corresponding to~~ the spontaneous fission rate being taken, wherein that value for the spontaneous fission rate is linked to ~~associated with~~ the neutron source mass.

14. (previously presented) A method as recited in claim 13, wherein the signals include a series of pulses, comprising:

receiving an initial pulse;

after a preset period of time after the initial pulse is received,

opening an observational interval; and

counting a number of pulses falling within the observational interval, wherein the number of pulses is related to the single, double, triple, and greater numbers of neutron counts.

15. (previously presented) A method according to claim 13 in which the probability distribution assigned to the spontaneous fission rate (F_s), the self induced fission rate (M), the detection efficiency (ε) and the α,n reaction rate (α) is a normal distribution.

16. (previously presented) A method according to claim 13 in which the probability distribution assigned to the spontaneous fission rate (F_s), the self induced fission rate (M), the detection efficiency (ε) and the α,n reaction rate (α) is a flat distribution.

17. (previously presented) A method according to claim 13 in which the probability distribution assigned to the spontaneous fission rate (F_s), the self induced fission rate (M), the detection efficiency (ε) and the α,n reaction rate (α) is a triangular distribution.

18. (previously presented) A method according to claim 15 in which a normal distribution is used for at least one of the counting rates.

19. (previously presented) A method according to claim 16 in which a normal distribution is used for at least one of the counting rates.

20. (previously presented) A method according to claim 17 in which a normal distribution is used for at least one of the counting rates.

21. (previously presented) A method according to claim 15 in which a flat distribution is used for at least one of the counting rates.

22. (previously presented) A method according to claim 16 in which a flat distribution is used for at least one of the counting rates.

23. (previously presented) A method according to claim 17 in which a flat distribution is used for at least one of the counting rates.

24. (previously presented) A method according to claim 15 in which a triangular distribution is used for at least one of the counting rates.

25. (previously presented) A method according to claim 16 in which a triangular distribution is used for at least one of the counting rates.

26. (previously presented) A method according to claim 17 in which a triangular distribution is used for at least one of the counting rates.

27. (currently amended) A method of monitoring a sample containing a neutron source in which:

i) signals from a plurality of neutron detectors are analyzed and the count rates for single, double, and triple incidence of neutrons on the detectors are determined;

ii) the single, double, and triple count rates are equated to a mathematical function related to the spontaneous fission rate, self induced fission rate, detection efficiency and α,n reaction rate;

iii) a probability distribution is assigned to each of the spontaneous fission rate, the self induced fission rate, detection efficiency, and α,n reaction rate and each of the counting rates to provide a probability distribution factor for any given value;

iv) and the value of the product of all the probability distribution factors is increased to give an optimized solution and so provide a value for the spontaneous fission rate which is linked to the mass of the neutron source.

28. (currently amended) A method according to claim 27 in which the signals comprise a series of pulses in a sequence, each pulse causing a time period to be considered, with other pulses being received in that period being associated with the initial pulse, the number of pulses in the sequence giving the single, double, triple, and greater number of neutron counts.

29. (previously presented) A method according to claim 27 in which the probability distribution assigned to individual variables or counting rates is a normal distribution or a flat distribution or a triangular distribution.

30. (currently amended) A method according to claim 27 in which a normal distribution is used for one or more, ~~and most preferably all,~~ the-counting rates.

31. (currently amended) A method according to claim 27 in which triangular distributions are used for one or more of ~~, and most preferably all,~~ the individual variables, such as detector efficiency, fission rate, multiplication distribution and alpha distribution.

32. (previously presented) A method according to claim 27 in which a flat distribution is used for the fission rate.

33. (cancelled)